

LUCAS RICHARD FATH HENNEMAN, PH.D.

Assistant Professor of Environmental Engineering

lhennem@gmu.edu • lucashenneman.org

Sid and Reva Dewberry Department of Civil, Environmental and Infrastructure Engineering
Volgenau School of Engineering • George Mason University • Fairfax, VA 22030

Professional Experience

- Assistant Professor of Environmental Engineering** 2020 – present
Sid & Reva Dewberry Department of Civil, Environmental, and Infrastructure Engineering
Volgenau School of Engineering
George Mason University
- Postdoctoral Fellow** 2017 – 2020
Departments of Biostatistics and Environmental Health
T.H. Chan School of Public Health
Harvard University

Education

- Ph.D., Environmental Engineering, Georgia Institute of Technology** 2017
Thesis: *Air Pollution Accountability: Assessing Regulatory Impacts on Emissions and Air Quality*
Advisor: Dr. Armistead G. Russell
- M.S., Environmental Engineering, Georgia Institute of Technology** 2014
- B.S., Environmental Engineering, Johns Hopkins University with general honors** 2012

Research Interests

- Regulatory accountability
- Environmental justice and air quality
- Health effects of environmental interventions
- Environmental policy
- Air pollution modeling using statistical and numerical methods
- Big data applications—assessing environmental change over large spatial-temporal scales

Journal Publications

1. Wikle, N., Hanks, E., **Henneman., L.R.F.**, Zigler, C.M. (2022) “A mechanistic model of annual sulfate concentrations in the United States.” *Journal of the American Statistical Association*. <https://doi.org/10.1080/01621459.2022.2027774>.
2. Dey, T., Tyagi, P., Sabath, B., Kamareddine, L., **Henneman., L.R.F.**, Braun, D., Dominici, F. (2021) “Counterfactual time series analysis of short-term change in air pollution following the COVID-19 state of emergency in the United States.” *Scientific Reports*. <https://www.nature.com/articles/s41598-021-02776-0>

3. Chen, K., **Henneman, L.R.F.**, Nethery, R. (2021) “Differential impacts of COVID-19 Lockdowns on PM_{2.5} across the United States.” *Environmental Advances*.
<https://doi.org/10.1016/j.envadv.2021.100122>
4. Daouda, M., **Henneman, L.R.F.**, Kioumourtzoglou, M., Gemmill, A., Zigler, C.M., Casey, J. (2021) “Association between county-level coal-fired power plant pollution and racial disparities in preterm births from 2000 to 2018.” *Environmental Research Letters*. <https://doi.org/10.1088/1748-9326/abe4f7>
5. **Henneman, L.R.F.**, Shen, H., Hogrefe, C., Russell, A., Zigler, C.M. (2021) “Four decades of United States mobile source pollutants: spatial-temporal trends assessed by ground-based monitors, air quality models, and satellites.” *Environmental Science and Technology*.
<https://dx.doi.org/10.1021/acs.est.0c07128>
6. **Henneman, L.R.F.**, Dedoussi, I.C., Casey, J.A., Barrett, R.H., Choirat, C., and Zigler, C.M. (2020) “Comparisons of simple and complex methods for quantifying exposure to point source air pollution emissions.” *Journal of Exposure Science and Environmental Epidemiology*.
<https://doi.org/10.1038/s41370-020-0219-1>
7. Casey, J.A., Su, J.G., Barrett, M.A., **Henneman, L.R.F.**, Zigler, C.M., *et al.* (2020). “Improved asthma outcomes observed in the vicinity of coal power plant retirement, retrofit and conversion to natural gas.” *Nature Energy*. <https://doi.org/10.1038/s41560-020-0600-2>
8. Kim, C., **Henneman, L.R.F.**, Choirat, C., and Zigler, C.M. (2020). “Health Effects of Power Plant Emissions through Ambient Air Quality.” *Journal of the Royal Statistical Society*.
<https://doi.org/10.1111/rssa.12547>
9. Liao, S., **Henneman, L.R.F.**, and Zigler, C.M. (2020) “Posterior predictive treatment assignment methods for causal inference in the context of time-varying treatments.” *Epidemiological Methods*.
<https://doi.org/10.1515/em-2019-0024>
10. **Henneman, L.R.F.**, Mickley, L.J., and Zigler, C.M. (2019) “Air pollution accountability of energy transitions: the relative importance of wind fields and emissions in exposure changes.” *Environmental Research Letters*. <https://iopscience.iop.org/article/10.1088/1748-9326/ab4861>
11. **Henneman, L.R.F.**, Choirat, C., and Zigler, C.M. (2019). “Accountability Assessment of Health Improvements in the United States Associated with Reduced Coal Emissions Between 2005 and 2012.” *Epidemiology*.
https://journals.lww.com/epidem/Fulltext/2019/07000/Accountability_Assessment_of_Health_Improvements.3.aspx
12. Shen, H., Chen, Y., Li, Y., Russell, A., Hu, Y., **Henneman, L.R.F.**, *et al.* (2019). “Relaxing energy policies on top of climate change will significantly undermine states’ efforts to attain U.S. ozone standards.” *One Earth*. [https://www.cell.com/one-earth/fulltext/S2590-3322\(19\)30073-9](https://www.cell.com/one-earth/fulltext/S2590-3322(19)30073-9)
13. Yu, X., Stuart, A., Liu, Y., Ivey, C., Russell, A., Kan, H., **Henneman, L.R.F.**, Sarnat, S., Hasan, S., Sadmani, A., Yang, X., Yu, H. (2019), “On the potential of Google Maps location history data to characterize historical individual mobility for retrospective air pollution health studies.” *Environmental Pollution*. <https://www.sciencedirect.com/science/article/pii/S0269749118359049>
14. **Henneman, L.R.F.**, Liu, C., Chang, H., Mulholland, J., Tolbert, P., Russell, A. (2019) “Emissions reductions and air quality responses in Atlanta, Georgia in response to regulations: developing daily time series of changes in ten pollutants and uncertainties.” *Environment International*.
<https://www.sciencedirect.com/science/article/pii/S0160412018323110>
15. Qian, Y., **Henneman, L.R.F.**, Mulholland, J.A., Russell, A.G. (2019). “Empirical Development of Ozone Isopleths: Applications to Los Angeles.” *Environmental Science and Technology Letters*.
<https://pubs.acs.org/doi/10.1021/acs.estlett.9b00160>
16. Abrams, J., Klein, M., **Henneman, L.R.F.**, Sarnat, S., Chang, H., Strickland, M., Mulholland, J.A., Russell, A.G., Tolbert, P. (2019). “Impact of air pollution control policies on cardiorespiratory emergency department visits, Atlanta, GA, 1999-2013.” *Environment International*.
<https://www.sciencedirect.com/science/article/pii/S0160412018328046>

17. **Henneman, L.R.F.**, Ivey, C., Choirat, C., Cummiskey, K., and Zigler, C.M. (2019). “Characterizing population exposure to coal emissions sources in the United States using the HyADS model.” *Atmospheric Environment*. <https://www.sciencedirect.com/science/article/pii/S1352231019300731>
18. Lawal, A.S., Guan, X., Liu, C., **Henneman, L.R.F.**, Bhogineni, V., Weber, R.J., Nenes, A., and Russell, A. (2018). “Linked Response of aerosol acidity and Ammonia to SO₂ and NO_x Emissions Reductions in the US.” *Environmental Science and Technology*. <https://pubs.acs.org/doi/abs/10.1021/acs.est.8b00711?af=R&>
19. Shen, H., Chen, Y., Chen, Y., Fan, R., Li, Y., Zeng, E., Huang, Y., Yu, H., Shen, G., Shen, H., Zhong, Q., Russell, A., **Henneman, L.R.F.**, Ru, M., Zou, Y., Hu, Y. (2018). “Impacts of rural worker migration on air quality and health in China: From the perspective of upgrading residential energy consumption.” *Environment International*. <https://www.sciencedirect.com/science/article/pii/S0160412017315945>
20. **Henneman, L.R.F.**, Liu, C., Shen, H., Hu, Y., Mulholland, J., Russell, A. (2017). “Responses in ozone and its production efficiency attributable to recent and future emissions changes in the eastern United States.” *Environmental Science and Technology*. <http://pubs.acs.org/doi/10.1021/acs.est.7b04109>
21. **Henneman, L.R.F.**, Liu, C., Hu, Y., Mulholland, J., Russell, A. (2017). “Air quality modeling for accountability research: Operational, dynamic, and diagnostic evaluation.” *Atmospheric Environment*. <https://doi.org/10.1016/j.atmosenv.2017.07.049>
22. **Henneman, L.R.F.**, Chang, H., Lavoué, D., Mulholland, J., Russell, A. (2017). “Assessing regulatory impacts on ozone and PM_{2.5} using empirically- and air quality model-derived pollutant sensitivities.” *Air Quality, Atmosphere, and Health*. <https://link.springer.com/article/10.1007%2Fs11869-017-0463-2>
23. **Henneman, L.R.F.**, Liu, C., Mulholland, J., Russell, A. (2016). “Evaluating the effectiveness of air quality regulations: A review of accountability studies and frameworks.” *Journal of the Air and Waste Management Association*. <http://www.tandfonline.com/doi/abs/10.1080/10962247.2016.1242518>
24. **Henneman, L.R.F.**, Rafaj, P., Annegarn, H., Klausbrückner, C. (2015). “Assessing emissions levels and costs associated with climate and air pollution policies in South Africa.” *Energy Policy*. <http://www.sciencedirect.com/science/article/pii/S0301421515302044>
25. Klausbrückner, C., Annegarn, H., **Henneman, L.R.F.**, and Rafaj, P. (2015). “A policy review of synergies and trade-offs in South African climate change mitigation and air pollution control strategies.” *Environmental Science and Policy*. <http://www.sciencedirect.com/science/article/pii/S1462901115301180>
26. **Henneman, L.R.F.**, Holmes, H., Mulholland, J., Russell, A. (2015). “Meteorological Detrending of Primary and Secondary Pollutant Concentrations: Methods Application and Evaluation Using Long-Term (2000-2012) Detailed Data.” *Atmospheric Environment*. <http://www.sciencedirect.com/science/article/pii/S1352231015302521>
27. Francis, R., Guikema, S., **Henneman, L.R.F.** (2014). “Bayesian Belief Networks for Predicting Drinking Water Distribution System Pipe Breaks.” *Reliability Engineering & System Safety*, 130, 1–11. <http://www.sciencedirect.com/science/article/pii/S0951832014000921>

Manuscripts in Review

1. **Henneman, L.R.F.**, Zigler, C.M., *et al.* “22 years of declining PM_{2.5} coal source exposure and inequities.” *In review*.
2. Cummiskey, K., Kim, C., Choirat, C., **Henneman, L.R.F.**, Schwartz, J., and Zigler, C.M. “A Source-Oriented Approach to Coal Power Plant Health Effects.” <https://arxiv.org/abs/1902.09703>. *In review*.

Reports

1. Russell, A.G., Tolbert, P., **Henneman, L.R.F.**, Abrams, J., Liu, C., Klein, M., Mulholland, J.A., Sarnat, S., Hu, Y., Chang, H., Odman, T., Strickland, M., Shen, H., Lawal, A. “Impacts of regulations on air quality and emergency department visits in the Atlanta metropolitan area, 1999-2013.” *The Health Effects Institute*. <https://www.healtheffects.org/publication/impacts-regulations-air-quality-and-emergency-department-visits-atlanta-metropolitan>

Book Chapters

1. **Henneman, L.R.F.**, Shen H., Liu, C., Hu, Y., Mulholland, J.A., Russell, A.G. “Ozone in the eastern United States: production efficiency variability over time and between sources.” 2020. *Air Pollution Modeling and its Application XXVI*. <https://www.springer.com/gp/book/9783030220549>
2. Klausbruckner, C., **Henneman, L.R.F.**, Rafaj, P., Annegarn, H. “Energy policy, regional air quality, and climate mitigation in South Africa: the case for Integrated Assessment.” 2018. *Applying Systems Analysis to Complex Global Problems*. https://link.springer.com/chapter/10.1007%2F978-3-319-71486-8_7
3. **Henneman, L.R.F.**, Liu, C., Chang, H., Lavoué, D., Mulholland, J.A., Russell, A.G. 2016. “Estimating the Impact of Air Pollution Controls on Ambient Concentrations.” *Air Pollution Modeling and its Application XXIV*. <http://www.springer.com/us/book/9783319244761>

In the News

1. “Air, Lies, and Instagram: Did the air really get better during the lockdown?” *Sierra: The Magazine of the Sierra Club*. 19 May, 2022. <https://www.sierraclub.org/sierra/did-air-quality-pollution-improve-covid>
2. “Mason DEVA Project addresses state wide air pollution.” *VSE Express*. 15 October, 2022. <https://volgenau.gmu.edu/news/2021-10/mason-deva-project-addresses-state-wide-air-pollution>
3. “Mason Engineer researcher investigates air pollution’s impact on health.” *VSE Express*. 1 October, 2020. <https://volgenau.gmu.edu/news/588781>
4. “INSIGHT: On Air Pollution Eastern States Are Right to Point Fingers.” *Bloomberg Environment and Energy Report*. 5 December, 2019. <https://news.bloombergenvironment.com/environment-and-energy/insight-on-air-pollution-eastern-states-are-right-to-point-fingers>

Invited Presentations

1. “Spatial-temporal trends in four decades of United States on-road air pollution.” 10th CRC Mobile Source Air Toxics Workshop. 8-10 February, 2022.
2. “People and power plants: estimating health impacts of energy transitions in the United States.” University of Texas, San Antonio Environmental Sciences and Engineering seminar. 10 October, 2020.
3. “People and power plants: estimating health impacts of energy transitions in the United States.” Columbia University NIEHS Seminar. 5 December, 2019.
4. “Direct estimates of health improvements from reduced emissions at coal power plants.” University of Texas at Austin Environmental Health Interest Group Meeting. Austin, TX. 23 January, 2019.
5. “Direct estimates of health improvements from reduced emissions at coal-fired power plants.” EPA Air, Climate, and Energies Centers Work-in-Progress Webinar. 20 September, 2018.

6. “Accountability assessment: The 1990 Clean Air Act Amendments.” CRC Mobile Source Air Toxics Meeting. 14-15 February, 2017. Sacramento, CA.

Conference Presentations

1. **Henneman, L.R.F.**, Shen, H., Russell, A., and Zigler, C.M. “Four decades of United States on-road air pollution: spatial-temporal trends assessed by ground-based monitors, air quality models, and satellites.” Community Modeling and Analysis System Conference. 26-30 October, 2020. Virtual. [Oral Presentation.](#)
2. **Henneman, L.R.F.**, Choirat, C., and Zigler, C.M. “Health improvements associated with reduced power plant emissions in the United States between 2005 and 2012.” International Society for Environmental Epidemiology. 24-27 August, 2020. Virtual. Oral Presentation.
3. **Henneman, L.R.F.**, Choirat, C., and Zigler, C.M. “HyADS: A tool for estimating nationwide exposures to emissions from a large number of sources.” Community Modeling and Analysis System Conference. 21-23 October, 2019. Chapel Hill, NC. Oral Presentation.
4. **Henneman, L.R.F.**, Ivey, C., Choirat, C., Cummiskey, K., and Zigler, C.M. “Direct estimates of health improvements from reduced coal power plant emissions exposure.” Community Modeling and Analysis System Conference. 22-24 October, 2018. Chapel Hill, NC. Oral Presentation.
5. **Henneman, L.R.F.**, Shen H., Liu, C., Hu, Y., Mulholland, J.A., Russell, A.G. “Ozone in the eastern United States: production efficiency variability over time and between sources.” 36th International Technical Meeting on Air Pollution Modelling and its Application. 14-18 May, 2018. Ottawa, Ontario, Canada. Oral Presentation.
6. **Henneman, L.R.F.**, Liu, C., Hu, Y., Mulholland, J., Russell, A. “Impacts of emission changes on air quality and acute health effects in the Southeast, 1993-2012.” Air & Waste Management Annual Conference and Exhibition. 20-23 June, 2016. New Orleans, LA. Oral Presentation.
7. **Henneman, L.R.F.**, Liu, C., Hu, Y., Mulholland, J., Russell, A. “Dynamic analysis: assessing CMAQ’s ability to capture air quality trends over a time period of changing emissions.” Community Modeling and Analysis System Conference. 24-26 October, 2016. Chapel Hill, NC. Oral Presentation.
8. **Henneman, L.R.F.**, Lavoue, D., Liu, C., Ivey, C., Hu, Y., Mulholland, J., Russell, A. “A Comparison of Air Pollution Sensitivities to Emissions Estimated Using First-Principles and Statistical Models.” Community Modeling and Analysis System Conference. 5-7 October, 2015. Chapel Hill, NC. Poster.
9. **Henneman, L.R.F.**, Lavoue, D., Liu, C., Ivey, C., Hu, Y., Mulholland, J., Russell, A. “A Comparison of Air Pollution Sensitivities to Emissions Estimated Using First-Principles and Statistical Models.” Community Modeling and Analysis System Conference. 5-7 October, 2015. Chapel Hill, NC. Poster.
10. **Henneman, L.R.F.** “Estimating Impacts of Air Pollution Controls on Ambient Concentrations.” Air & Waste Management Southern Section Conference. 19-21 August, 2015. Callaway Gardens, GA. Oral Presentation.
11. **Henneman, L.R.F.**, Liu, C., Lavoué, D., Chang, H., Mulholland, J., Russell, A. “Estimating the Impact of Air Pollution Controls on Ambient Concentrations.” 34th International Technical Meeting on Air Pollution Modelling and its Application. Montpellier, France. 4-8 May, 2015. Oral Presentation.
12. **Henneman, L.R.F.**, Lavoue, D., Homes, H., Mulholland, J., Russell, A. “Estimating Empirical Sensitivities of Air Pollutants to Emissions using Statistical Modeling.” Community Modeling and Analysis System Conference. 27-29 October, 2014. Chapel Hill, NC. Oral presentation.
13. **Henneman, L.R.F.**, Lavoue, D., Homes, H., Mulholland, J., Russell, A. “Estimating the Impacts of Air Pollution Controls on Ambient Concentrations.” Annual Conference of the American Association for Aerosol Research. 20-24 October, 2014. Orlando, FL. Oral Presentation.

Selected Research Funding

- The Health Effects Institute Rosenblith New Investigator Award* Awarded: 2022-2025
 Air pollution source impacts at fine scales for long-term regulatory accountability and environmental justice
 Role: Principal Investigator
<https://www.healtheffects.org/announcements/walter-rosenblith-new-investigator-2021-announced>
- The Health Effects Institute: Energy* Awarded: 2022-2025
 Development and application of a community model to evaluate exposures to air pollutants from UOGD and inform future health studies
 Role: Co-Investigator
- The National Institutes of Health* Awarded: 2021-2026
 Historical social and environmental determinants of memory decline and dementia among U.S. older adults
 Role: Co-Investigator
- The National Institutes of Health* Awarded: 2021-2026
 Historical social and environmental determinants of memory decline and dementia among U.S. older adults
 Role: Co-Investigator
- The Health Effects Institute* Awarded: 2020-2023
 Accounting for the health benefits of air pollution regulations in China, 2008-2020
 Role: Co-Investigator
<https://www.healtheffects.org/research/ongoing-research/accounting-health-benefits-air-pollution-regulations-china-2008%E2%80%932020>

Academic Advising

Ph.D. students

- Munshi Md Rasel (2020-present)
- Shreya Guha (2020-present)
- Xiaorong Shan (2021-present)

Undergraduate students

- Sara Alhassani (2021)
- Ryah Nadjafi (2021)
- Zainab Syed (2021)
- Gabi Armada (2021)
- Trajan Smeeth (2021)
- Ryan Stauden (2021)

Academic Committees

PhD Thesis Committee

- Azbina Rahman (2021)
- Seth Lawler (2021)

- Felicio Cassalho (2022)
- Ishrat Dollan (2022)

Qualifying Exam

- Felicio Cassalho (2021)
- Munshi Md Rasel (2021)
- Shreya Guha (2021)
- Meghana Kuppa (2021)
- Allan Rowley (2021)
- Ishrat Dollan (2020)

Classes Taught

CEIE 450/550: Environmental Engineering Systems	Fall 2020
CEIE 649: Air Pollution Formation and Control	Spring 2021, Fall 2022
CEIE 603: Research Methods in Civil Engineering	Fall 2021

Professional Service

- EPA Science Advisory Committee on Chemicals *ad-hoc* member for the TSCA Screening Level Approach for Assessing Ambient Air and Water Exposures to Fenceline Communities Version 1.0 (March 2022)
- EPA Review Panel for Science to Achieve Results (STAR) program [Call: Development of Innovative Approaches to Assess the Toxicity of Chemical Mixtures] (February 2022)
- Reviewer, EPA's TrackMyAir mobile app (February 2022)
- Vice President of External Affairs and Treasurer, Harvard School of Public Health Post-Doctoral Association (2017-2020)
- Various roles, Georgia Tech Association of Environmental Engineers and Scientists student group (2012-2017; Co-President 2015-2017)
- Treasurer, Georgia Tech Chapter of the Air and Waste Management Association (2014-2016)
- Journal Referee: *Air Pollution Research; Air Quality, Atmosphere, and Health; American Journal of Epidemiology; Atmosphere; Atmospheric Chemistry and Physics; Arabian Journal of Geosciences; Atmospheric Environment; Energy Policy; Engineering Reports; Environmental Health Perspectives; Environment International; Environmental Impact Assessment; Environmental Policy; Environmental Science and Pollution Research; Environmental Science and Technology; International Journal of Environmental Research and Public Health; International Journal of Epidemiology; The Lancet Public Health; Nature Communications; Nature Energy; One Earth; Open Forum Infectious Disease; Journal of the Air and Waste Management Association; Journal of Environmental Management; Journal of Environmental Policy; Journal of Environmental Studies and Sciences; Journal of Exposure Science and Environmental Epidemiology; Science Advances; Science of the Total Environment*

Academic and Professional Honors

- Georgia Tech School of Civil and Environmental Engineering Best PhD Thesis Award (2017)
- National Science Foundation Graduate Research Fellowship (2012-2017)

- Georgia Tech Association of Environmental Engineers and Scientists Outstanding PhD Student Award (2017)
- Georgia Tech President's Fellowship (2012-2016)
- Air and Waste Management Association Scholarship (2016)
- International Institute for Applied Systems Analysis (IIASA) Southern African Young Scientists Summer Program (2014-2015)
- Air and Waste Management Georgia Chapter Scholarship (2014)
- Air and Waste Management Association Southern Section Scholarship (2014)
- Johns Hopkins University Department of Geography and Environmental Engineering Faculty Award for Service and Academic Achievement (2012)
- Trans-Atlantic Program for Young Technology Leaders Delegate to Germany for the German-American Chamber of Commerce (2011)
- Thomas J. Watson Memorial Scholarship (2008-2012)

Community

- Board Member, Arlington Families for Safe Streets (2021-present)
- Science Fair Judge, Loudoun County Public Schools Regional Science & Engineering Fair (2021)
- Data science volunteer, Green Streets Initiative (2018)
- Assistant Coach, Chamblee High School Baseball, Chamblee, GA (2014-2017)
- Varsity Baseball, Johns Hopkins University (2008-2012)